



Biology - 9700

■ 100 Questions

Topics Covered :

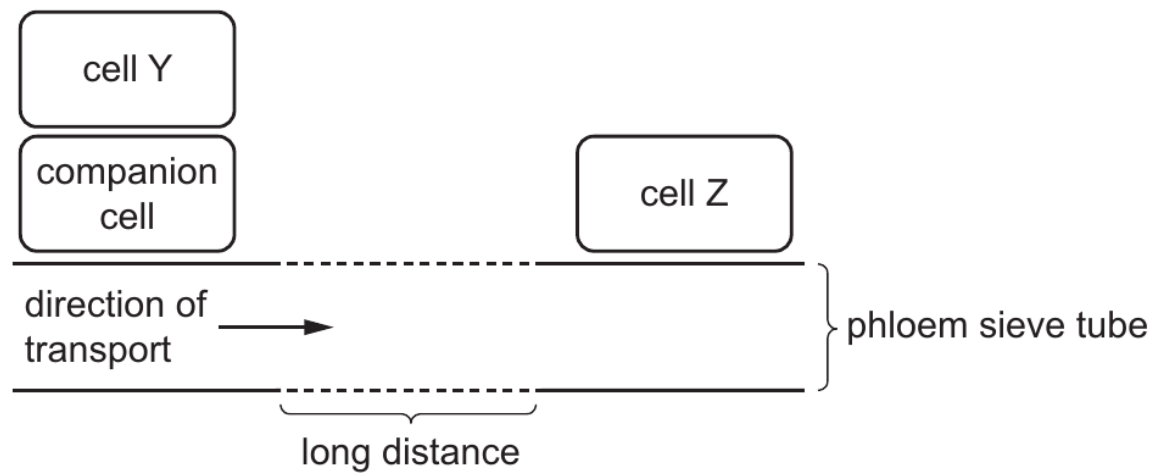
- ✓ 7.2 - Transport mechanisms
- ✓ 7.1 - Structure of transport tissues

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Question No 1 - (9700_w24_13_28)

The diagram shows some structures used for transport in the phloem.

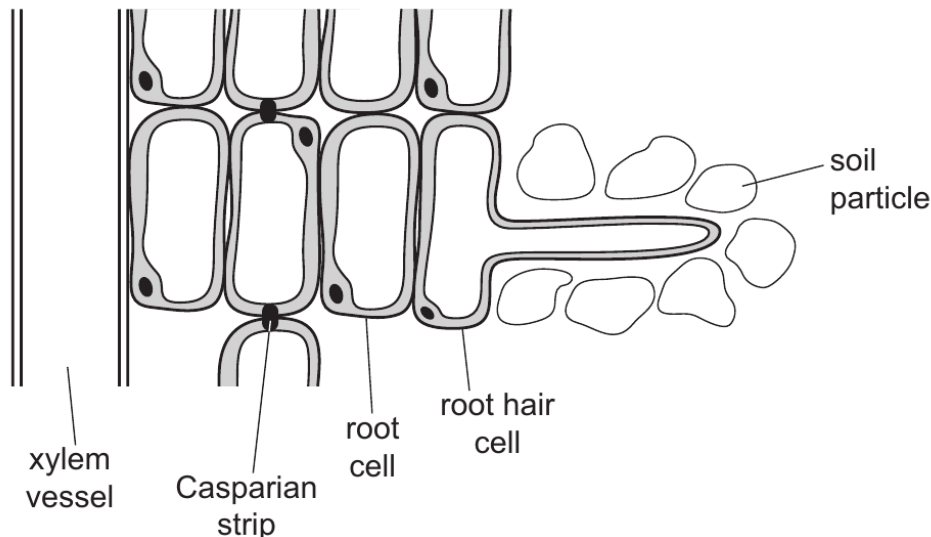


Which statement is correct?

- A** Cell Y is the sink cell.
- B** Cell Z can be above or below cell Y in the plant.
- C** Cell Z must be in a photosynthetic tissue.
- D** Cell Y allows glucose to move to the sieve tube via the companion cell.

Question No 2 - (9700_w24_13_29)

The diagram shows a section through a root of a dicotyledonous plant.



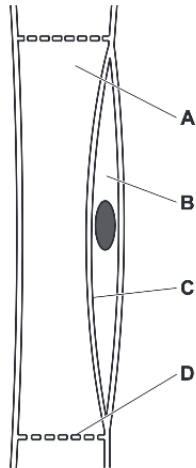
Which statement correctly describes the movement of water and solutes through this root?

- A** A layer of suberin causes water and solutes to move from the apoplast pathway into the symplast pathway.
- B** A layer of suberin causes water and solutes to move from the symplast pathway into the apoplast pathway.
- C** The tonoplast causes water and solutes to move from the symplast pathway into the apoplast pathway.
- D** The tonoplast causes water and solutes to move from the apoplast pathway into the symplast pathway.

Question No 3 - (9700_w24_12_26)

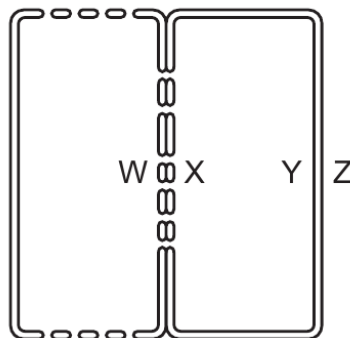
The diagram shows a longitudinal section of a phloem sieve tube with a companion cell.

Where are the mitochondria located for the release of energy for cotransport?



Question No 4 - (9700_w24_12_27)

The diagram shows a phloem sieve tube element and a companion cell that are involved in translocation of sucrose.



Which process correctly describes the translocation of sucrose through these cells?

- A** Sucrose moves from Y to Z by active transport.
- B** Protons move from Y to Z by active transport.
- C** Protons move from Z to Y by diffusion.
- D** Protons move from X to W by diffusion.

Question No 5 - (9700_w24_12_28)

Which types of molecules are cotransported into companion cells?

- A monomers and disaccharides
- B monomers and polysaccharides
- C polymers and disaccharides
- D polymers and monosaccharides

Question No 6 - (9700_w24_11_27)

Which statement correctly identifies the movement of sucrose and amino acids in plant vascular tissue?

- A They are carried from source to sink by mass flow in upward and downward directions.
- B They are carried from sink to source by cohesion-tension in upward and downward directions.
- C They are carried from sink to source by mass flow in one direction.
- D They are carried from source to sink by cohesion-tension in one direction.

Question No 7 - (9700_w24_11_28)

Xylem vessel elements are specialised cells that are adapted for the transport of water.

Which statement correctly matches an adaptation of a xylem vessel element to its function?

- A Cytoplasm is only found in a thin layer next to the cell walls and does **not** contain any organelles. This reduces resistance to the flow of water in the xylem vessels.
- B The end walls between xylem vessel elements have partially broken down, forming end plates. This reduces resistance to the flow of water in the xylem vessel.
- C The walls of the xylem vessel elements contain cellulose that is hydrophilic and can form hydrogen bonds to water, allowing adhesion of water molecules to the vessel walls.
- D Xylem vessel elements have plasmodesmata that connect them with companion cells. The companion cells provide ATP, which is needed for the transport of water.

Question No 8 - (9700_w24_11_29)

A student makes an accurate labelled plan diagram of a section of a leaf containing a vascular bundle.

Which statement correctly describes part of their plan diagram?

- A** The vascular bundle has labels for the xylem vessel elements, phloem sieve tube elements and companion cells.
- B** The vascular bundle is divided into two sections, with the section closer to the upper epidermis labelled as xylem and the other section labelled as phloem.
- C** In the section of the vascular bundle positioned closer to the lower epidermis, each sieve tube element has an associated companion cell.
- D** The phloem sieve tube elements are drawn with thick cell walls to represent the lignin in the walls.

Question No 9 - (9700_w24_11_33)

The pumping action of the heart creates hydrostatic pressure in the blood. The table shows the hydrostatic pressure in a blood capillary.

	arteriole end of capillary / KPa	venule end of capillary / KPa
hydrostatic pressure in blood	4.2	1.7

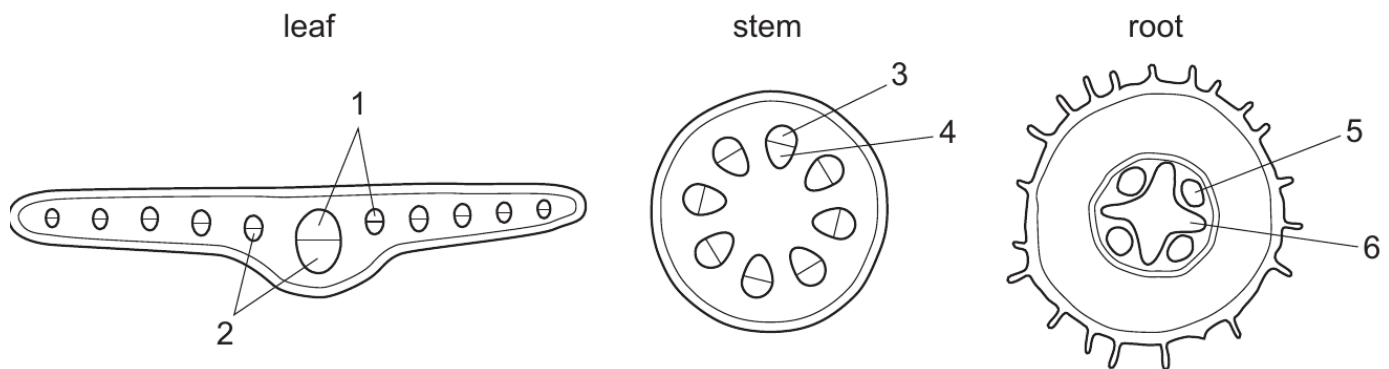
About 90% of the tissue fluid which surrounds a capillary is returned to the blood at the venule end.

How is this achieved?

- A** The capillary wall is more permeable at the arteriole end than the venule end.
- B** The hydrostatic pressure in tissue fluid is higher than in blood.
- C** There is a higher concentration of dissolved solutes in tissue fluid than in blood.
- D** There is osmotic movement of water from the tissue fluid into the blood.

Question No 10 - (9700_m16_12_23)

The diagrams show transverse sections of parts of a plant.



In the transverse sections, which tissues transport sucrose?

	1	2	3	4	5	6	
A	✓	✗	✓	✗	✗	✓	key ✓ = yes ✗ = no
B	✓	✗	✗	✓	✗	✓	
C	✗	✓	✓	✗	✓	✗	
D	✗	✓	✗	✓	✓	✗	

Question No 11 - (9700_m16_12_24)

Which statement describes movement through a plant in the apoplast pathway?

- A** Water moves through the cell walls.
- B** Water moves through the cytoplasm.
- C** Water moves through the plasmodesmata.
- D** Water moves through the vacuoles.

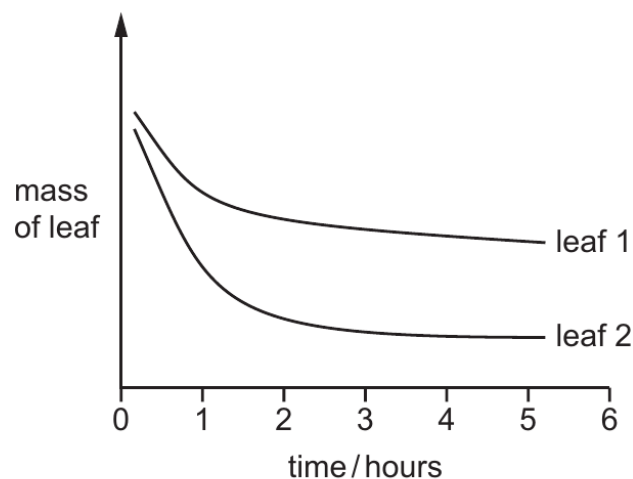
Question No 12 - (9700_m16_12_25)

Which changes to the water potential and the volume of liquid in the phloem occur when sucrose is moved from the phloem sieve tube to an actively dividing root tip?

	water potential in phloem sieve tube becomes	volume of liquid in phloem sieve tubes
A	less negative	decreases
B	less negative	increases
C	more negative	decreases
D	more negative	increases

Question No 13 - (9700_m16_12_26)

The diagram shows the results of an experiment using leaves with the same surface area from two different species of plant. Each leaf was left on a balance in daylight in a closed room and its mass recorded at 1 hour intervals.



Which features of leaf 2 could explain these results?

- 1 more stomata per unit area of leaf
- 2 fewer trichomes (hairs) on the leaf
- 3 sunken stomata
- 4 thinner cuticle

A 1, 2 and 3 **B** 1, 2 and 4 **C** 1 and 4 only **D** 2 and 3 only

Question No 14 - (9700_m16_12_27)

Which evidence supports the cohesion-tension theory for the movement of water in flowering plants?

- 1 When the rate of transpiration of a tree is at its maximum, the diameter of the trunk is at its minimum.
- 2 When a plant shoot is removed close to the base of the stem, sap leaks out from the cut.
- 3 Evaporation of water from a porous pot can exert a force that draws water up a glass tube attached underneath the pot.
- 4 Droplets of water form at the edge of leaves of plants growing in conditions of soil with high water content and air with high humidity.

A 1 and 2 **B** 1 and 3 **C** 2 and 4 **D** 3 and 4

Question No 15 - (9700_s24_13_25)

Which properties of water are dependent on hydrogen bonding between water molecules?

	cohesion	high latent heat of vaporisation	solvent action	high specific heat capacity
A	✓	✓	✓	✗
B	✓	✓	✗	✓
C	✓	✗	✓	✓
D	✗	✓	✓	✓

key

✓ = dependent

✗ = not dependent

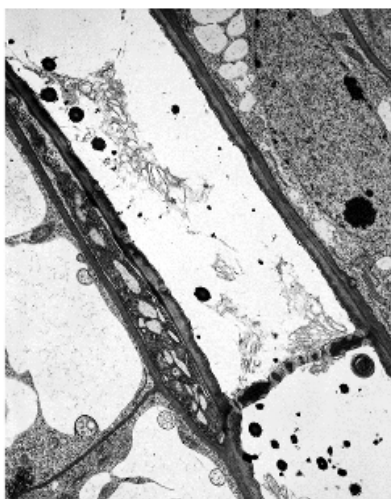
Question No 16 - (9700_s24_13_26)

Which substances in xylem tissue are impermeable to water and prevent the collapse of the vessels?

	impermeable to water	prevent collapse
A	cellulose	cellulose only
B	cellulose	lignin only
C	lignin	cellulose only
D	lignin	cellulose and lignin

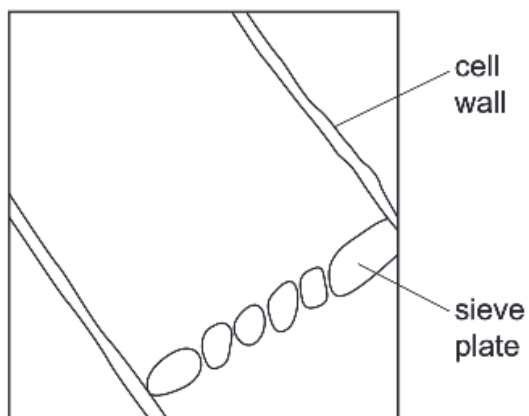
Question No 17 - (9700_s24_13_27)

27 The electron micrograph shows a longitudinal section through phloem tissue.

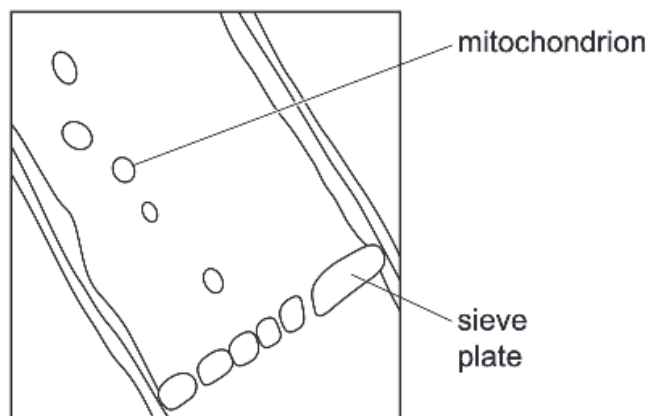


Which student's drawing of a sieve tube element is correctly drawn and labelled?

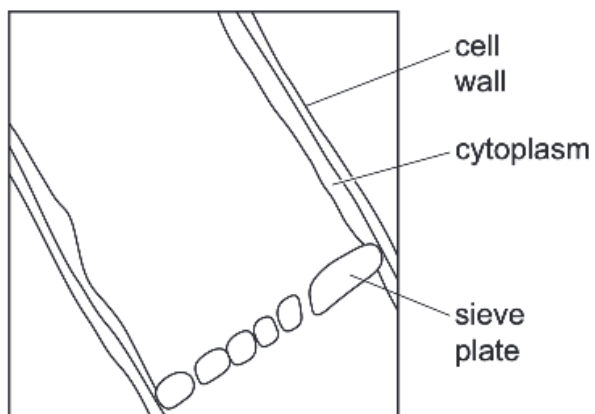
A



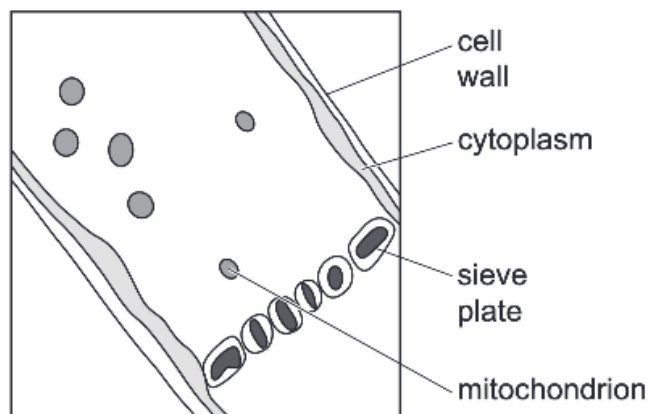
B



C

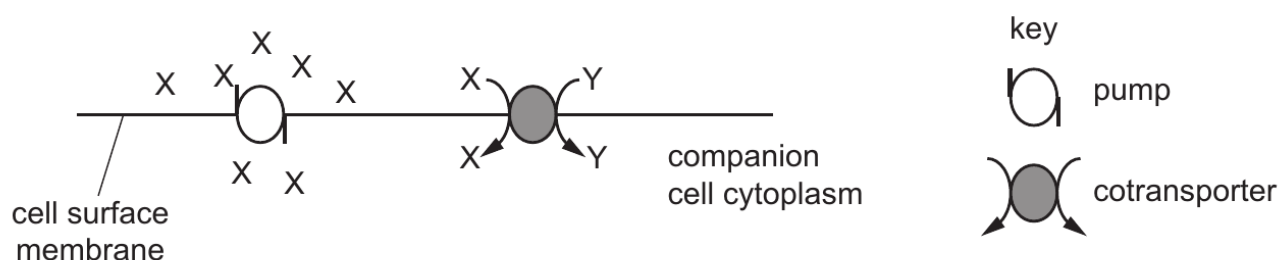


D



Question No 18 - (9700_s24_13_28)

Carrier proteins in the cell surface membranes of companion cells are involved in the transfer of assimilates to phloem sieve tubes. The diagram represents the use of two types of carrier protein in this process.



What are the substances labelled X and Y?

	X	Y
A	H ⁺ ions	sucrose
B	H ⁺ ions	glucose
C	sucrose	H ⁺ ions
D	glucose	H ⁺ ions

Question No 19 - (9700_s24_12_24)

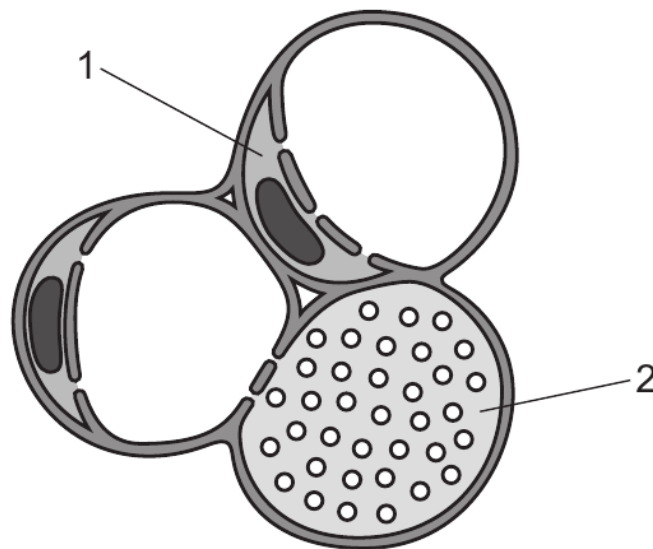
Which row correctly identifies sinks for sucrose transported by mass flow in plants?

	root storage organ	growing leaf bud	growing shoot tip
A	✓	✓	✓
B	✓	x	✓
C	x	✓	x
D	x	x	✓

key
 ✓ = sink
 x = not a sink

Question No 20 - (9700_s24_12_25)

The diagram shows a transverse section through a transport tissue in a plant.



Which row correctly identifies cell 1 and cell 2?

	cell 1	cell 2
A	companion cell	phloem sieve tube element
B	companion cell	xylem vessel element
C	phloem sieve tube element	phloem sieve tube element
D	phloem sieve tube element	xylem vessel element

Question No 21 - (9700_s24_12_26)

Which statement correctly describes the movement of solutes in the symplast pathway?

- A** Cell surface membranes regulate the selective absorption of solutes into the symplast pathway.
- B** Plasmodesmata control the movement of solutes from the symplast pathway to the apoplast pathway.
- C** The symplast pathway transports dissolved mineral ions from the soil that **cannot** be transported by the apoplast pathway.
- D** The movement of solutes through plasmodesmata in the symplast pathway is prevented in the endodermis by suberin.

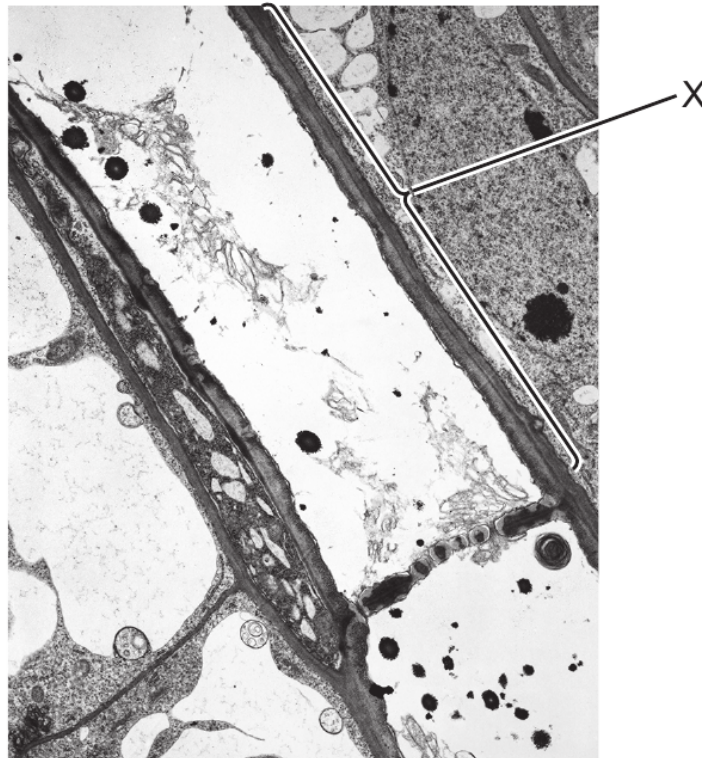
Question No 22 - (9700_s24_12_27)

Which statement helps to explain why water molecules are forced to move through xylem vessel elements as a consequence of transpiration?

- A** Water molecules form hydrogen bonds with cellulose in the walls of xylem vessel elements in a process known as adhesion.
- B** Water molecules form hydrogen bonds with neighbouring water molecules in a process known as cohesion.
- C** Water molecules form ionic bonds with dissolved mineral ions, which helps to keep the water molecules together in a continuous column.
- D** Water has a high latent heat of vaporisation and this prevents the evaporation of water in the xylem vessel elements.

Question No 23 - (9700_s24_11_24)

The electron micrograph shows a longitudinal section of part of the stem of a plant.



What is the name of the structure labelled X?

- A** companion cell
- B** Casparian strip
- C** phloem sieve tube element
- D** xylem vessel element

Question No 24 - (9700_s24_11_25)

Which substance makes xylem vessel walls impermeable to water?

- A** cellulose
- B** lignin
- C** suberin
- D** collagen

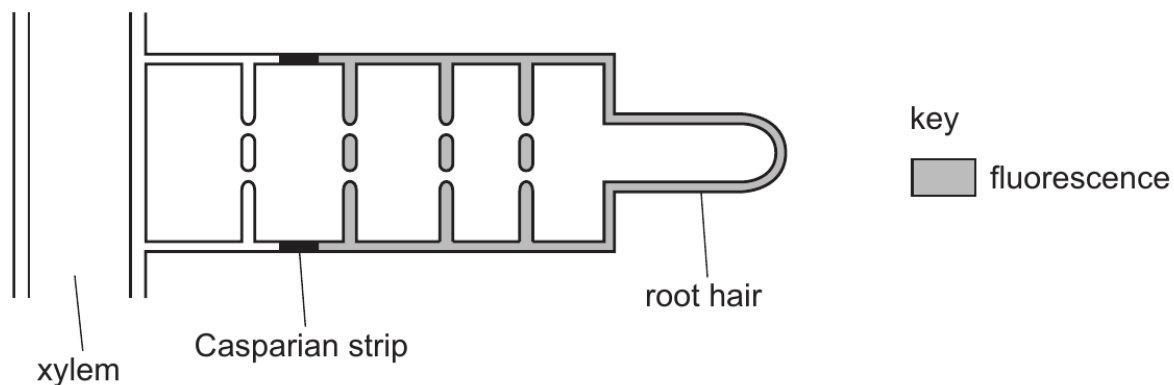
Question No 25 - (9700_m24_12_28)

Which statement correctly describes the association between a companion cell and its sieve tube cell?

- A** The companion cell provides all of the ATP used for energy-requiring processes in both types of cell.
- B** The companion cell controls the active transport of molecules through the sieve plates.
- C** The companion cell prevents side-to-side movement of assimilates between sieve tube cells.
- D** The companion cell provides a nucleus that controls cellular activities in both types of cell.

Question No 26 - (9700_m24_12_29)

A maize seedling was grown in soil that contained lanthanum ions labelled with a chemical that fluoresces under ultraviolet light. The diagram represents what was observed when a section of root was examined using a light microscope with ultraviolet illumination.



What is a correct conclusion about the transport of lanthanum ions in maize roots?

- A** The ions are **not** transported through the apoplast pathway or the symplast pathway.
- B** The ions are transported through the apoplast pathway only.
- C** The ions are transported through the apoplast pathway and symplast pathway.
- D** The ions are transported through the symplast pathway only.

Question No 27 - (9700_m24_12_30)

Which description of adhesion and cohesion is correct?

- A** Adhesion refers to the force between the water molecules due to hydrogen bonding. Cohesion refers to the force between water molecules and the xylem vessel walls.
- B** Adhesion refers to the reduced friction between hydrophobic lignin walls and the water molecules. Cohesion refers to the force between water molecules and the xylem vessel walls.
- C** Adhesion refers to the reduced friction between hydrophobic lignin walls and the water molecules. Cohesion refers to the force between water molecules due to hydrogen bonding.
- D** Adhesion refers to the force between the water molecules and the xylem vessel walls. Cohesion refers to the force between water molecules due to hydrogen bonding.

Question No 28 - (9700_m24_12_31)

Which conditions are needed to allow the mass flow of sucrose in phloem sieve tubes?

	phloem sieve tube in sources	phloem sieve tube in sinks
A	higher hydrostatic pressure higher water potential	lower hydrostatic pressure lower water potential
B	higher hydrostatic pressure lower water potential	lower hydrostatic pressure higher water potential
C	lower hydrostatic pressure higher water potential	higher hydrostatic pressure lower water potential
D	lower hydrostatic pressure lower water potential	higher hydrostatic pressure higher water potential

Question No 29 - (9700_w23_13_25)

Which statement about xylem vessel elements is correct?

- A** Hollow vessels enable the constant movement of water up and down a plant.
- B** Pits enable the movement of water into adjacent xylem vessels.
- C** Vessels contain numerous mitochondria to generate ATP for active transport.
- D** Vessels contain perforated cross-walls called sieve plates.

Question No 30 - (9700_w23_13_26)

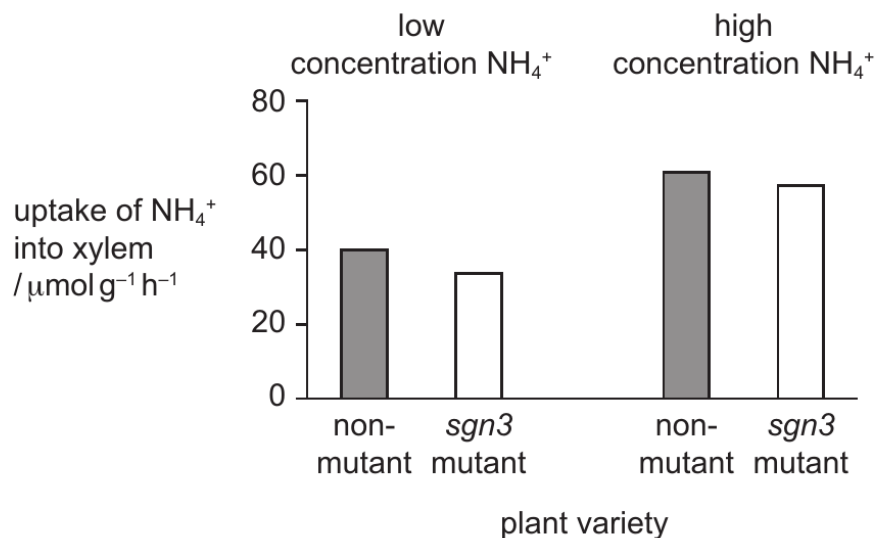
Ammonium ions, NH_4^+ , can enter the xylem of plant roots by two pathways.

- In the apoplast pathway, ammonium ions move through cell walls until this pathway is blocked by the Casparian strip. Ammonium ions then enter the cytoplasm of root cells.
- In the symplast pathway, ammonium ions move through the cytoplasm of root cells.

A scientist measured the uptake of ammonium ions into the xylem of *Arabidopsis thaliana*.

The *sgn3* mutant of *A. thaliana* does not have a Casparian strip. In the *sgn3* mutant, ammonium ions can enter the xylem without entering the cytoplasm of root cells.

The bar charts show the scientist's results.



Which conclusion is correct?

- A** Fewer ammonium ions enter the xylem when they have to move through the cytoplasm of root cells.
- B** More ammonium ions enter the xylem at low soil concentrations of ammonium ions.
- C** The Casparian strip acts as a barrier to reduce the movement of ammonium ions into the xylem.
- D** The loss of the Casparian strip has little effect on the movement of ammonium ions into the xylem.

Question No 31 - (9700_w23_13_27)

Which row correctly shows processes required for the movement of water from a root hair cell to the atmosphere?

	cohesion	diffusion	evaporation
A	✓	✓	✓
B	x	✓	x
C	✓	x	✓
D	x	✓	✓

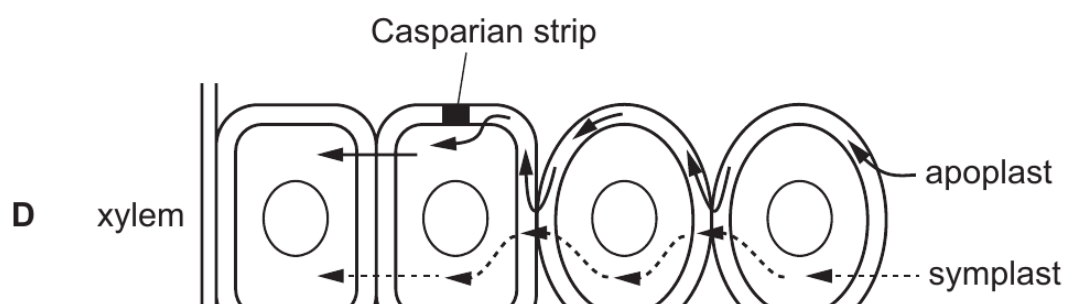
key

✓ = required

x = not required

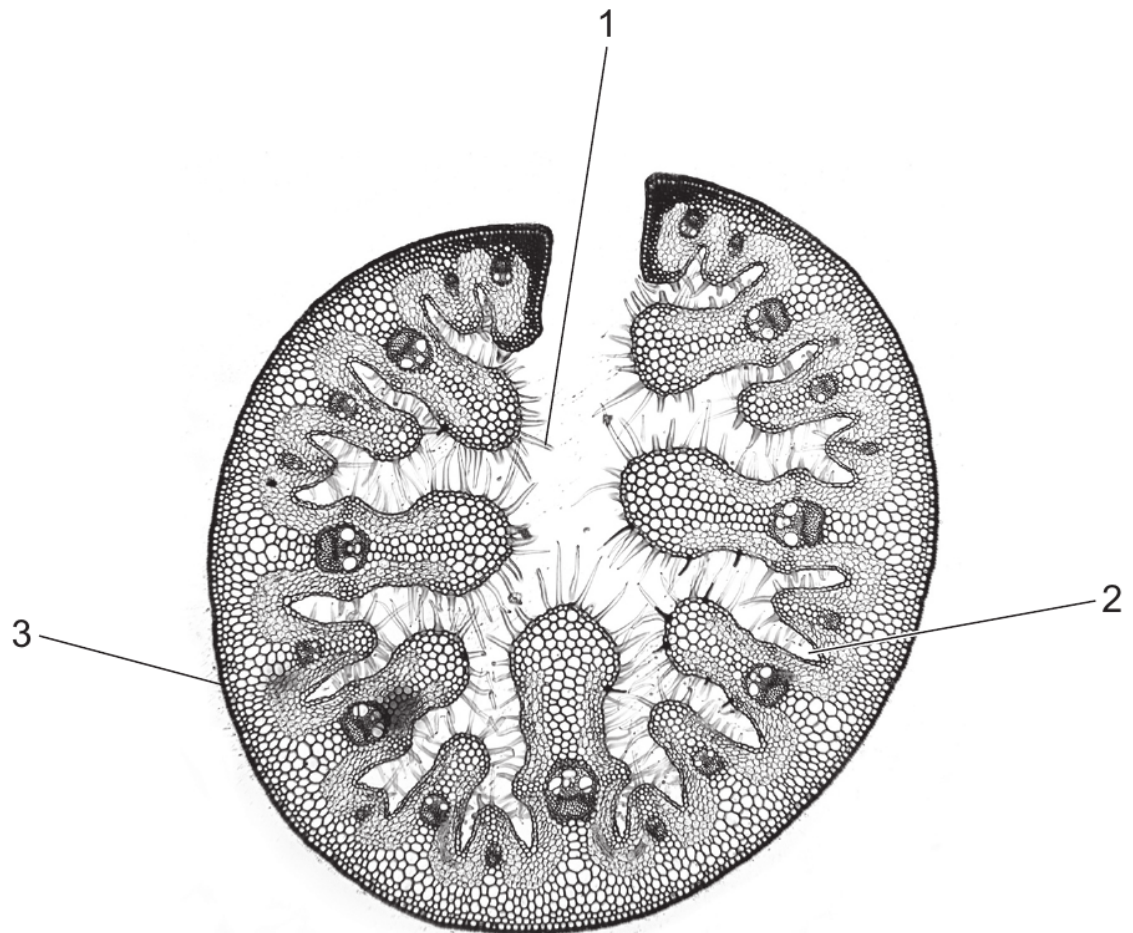
Question No 32 - (9700_w23_12_24)

Which sketch is the most accurate diagram of the two pathways?



Question No 33 - (9700_w23_12_25)

The photomicrograph shows some xerophytic adaptations in leaf tissue.



Which row shows the correct functions for structures 1, 2 and 3?

	reduces the water vapour concentration gradient between the inside and outside of the leaf	reduces evaporation from the epidermis of the leaf	traps a layer of moist air
A	1, 2 and 3	3 only	2 only
B	1 and 2 only	1, 2 and 3	1 and 2
C	1 only	2 and 3 only	1 and 2
D	2 and 3 only	1 and 2 only	1 only

Question No 34 - (9700_w23_12_26)

Which processes are required for the transfer of assimilates from a source cell into a phloem sieve tube?

- A** active transport, facilitated diffusion and simple diffusion
- B** active transport and exocytosis
- C** active transport and simple diffusion only
- D** active transport only

Question No 35 - (9700_w23_12_27)

When sucrose is loaded into the phloem it has to travel from mesophyll cells to a companion cell and then into the phloem.

Which row shows the relative concentrations of sucrose in each type of cell in order for this process to take place?

	relative concentration of sucrose / arbitrary units		
	mesophyll cell	companion cell	phloem sieve tube element
A	5	10	15
B	5	15	10
C	15	10	5
D	15	5	10

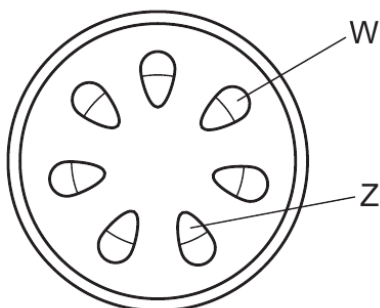
Question No 36 - (9700_w23_12_28)

Which feature of transport in plants is correct for xylem **and** phloem?

- A** It is passive.
- B** It occurs by mass flow.
- C** It occurs from source to sink.
- D** It occurs only in one direction.

Question No 37 - (9700_w23_11_26)

The plan diagram of a transverse section through a dicotyledonous plant stem was drawn by a student. They had stained the section with a chemical that stains lignin.



Which row is correct for tissues W and Z?

	W	Z	stained tissue
A	phloem	xylem	W
B	phloem	xylem	Z
C	xylem	phloem	W
D	xylem	phloem	Z

Question No 38 - (9700_w23_11_28)

A plant leaf seen in transverse section with a microscope shows the features listed.

- a thick waxy cuticle on upper surface
- sunken stomata on lower surface
- rolled leaf so the edges curl

What is this leaf adapted for?

- A** to decrease carbon dioxide uptake
- B** to increase carbon dioxide uptake
- C** to decrease water loss by transpiration
- D** to increase water loss by transpiration

Question No 39 - (9700_w23_11_29)

What occurs as carbohydrate is taken out of a sink into a phloem sieve tube element?

	water potential in phloem sieve tube element becomes	volume of liquid in phloem sieve tube element
A	higher	decreases
B	higher	increases
C	lower	decreases
D	lower	increases

Question No 40 - (9700_s23_13_27)

Which row correctly explains how the structures of phloem sieve tube elements and xylem vessel elements are related to their functions as transport systems?

	phloem sieve tube elements	xylem vessel elements
A	contain mitochondria to make ATP for the active loading of sucrose into the phloem	cell walls are thickened and contain lignin which makes xylem vessels waterproof
B	contain no nucleus so that dissolved solutes can move easily through cells	end walls between cells are perforated so that water can move easily through xylem vessels
C	end walls between cells are perforated so that dissolved solutes can move between cells	lignin in cell walls gives strength so that xylem vessels do not collapse due to transpiration pull
D	no end walls between cells so that sucrose solution can move up and down the phloem	contain no cytoplasm so that a continuous column of water can move up the xylem vessels

Question No 41 - (9700_s23_13_28)

Which component of plants is used by the apoplast pathway as water is moved from the soil to the xylem?

- A** Casparian strip
- B** cellulose
- C** endodermis

Question No 42 - (9700_s23_13_29)

Which statements correctly describe transport pathways in dicotyledonous plants?

- 1 In the symplast pathway, water may move through intercellular spaces.
- 2 The symplast pathway may be blocked by the tonoplast.
- 3 In the apoplast pathway, water does **not** move through plasmodesmata.
- 4 The apoplast pathway may be blocked by the Casparian strip.

A 1 and 2 **B** 1 and 4 **C** 2 and 3 **D** 3 and 4

Question No 43 - (9700_s23_13_30)

Plants, such as the tobacco plant, retain very little of the water they take in and the volume of water lost during transpiration is very high. This is because these plants can only absorb carbon dioxide through open stomata.

Plants use carbon dioxide to synthesise glucose molecules. It is estimated that 400 molecules of water are lost for each carbon dioxide molecule gained.

How many water molecules are lost for a plant to synthesise one molecule of glucose?

A 800 **B** 1200 **C** 2000 **D** 2400

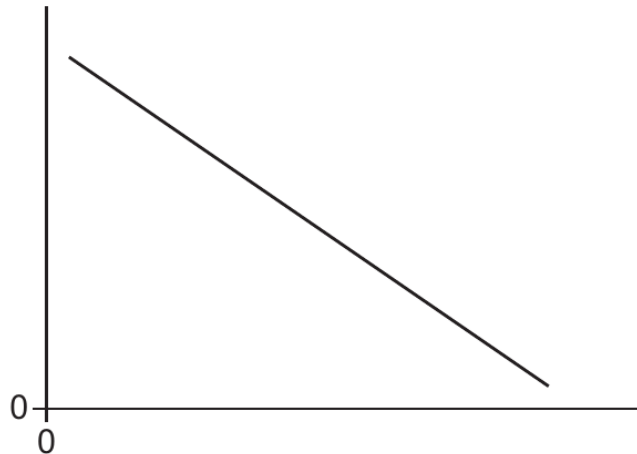
Question No 44 - (9700_s23_13_31)

Which changes occur as sucrose is transferred from leaves into phloem sieve tubes to be transported to a sink?

	water potential in phloem sieve tubes becomes	volume of liquid in phloem sieve tubes
A	less negative	decreases
B	less negative	increases
C	more negative	decreases
D	more negative	increases

Question No 45 - (9700_s23_13_32)

The graph shown does not have any axis labels.



Which row shows appropriate labels for the axes that would explain mass flow in phloem?

	x-axis	y-axis
A	distance from sink / m	hydrostatic pressure / kPa
B	hydrostatic pressure / kPa	distance from sink / m
C	distance from source / m	hydrostatic pressure / kPa
D	hydrostatic pressure / kPa	distance from source / m

Question No 46 - (9700_s23_12_26)

Which row identifies cells with plasmodesmata?

	phloem sieve tube element	companion cell	xylem vessel element
A	✓	✓	✓
B	✓	✓	✗
C	✓	✗	✓
D	✗	✓	✓

key

✓ = plasmodesmata present

✗ = plasmodesmata not present

Question No 47 - (9700_s23_12_27)

Which statements about the apoplast and symplast pathways are correct?

- 1 In the apoplast pathway, water molecules move through free spaces in the cellulose cell walls of plant roots.
- 2 In the symplast pathway, water molecules diffuse through the cytoplasm and plasmodesmata of cells.
- 3 Water molecules travelling through plant tissue move by mass flow along the apoplast pathway.
- 4 The Casparian strip blocks the symplast pathway and forces all water molecules to enter the cytoplasm of endodermis cells.

- A** 1, 2, 3 and 4
- B** 1, 2 and 3 only
- C** 1 and 2 only
- D** 3 and 4 only

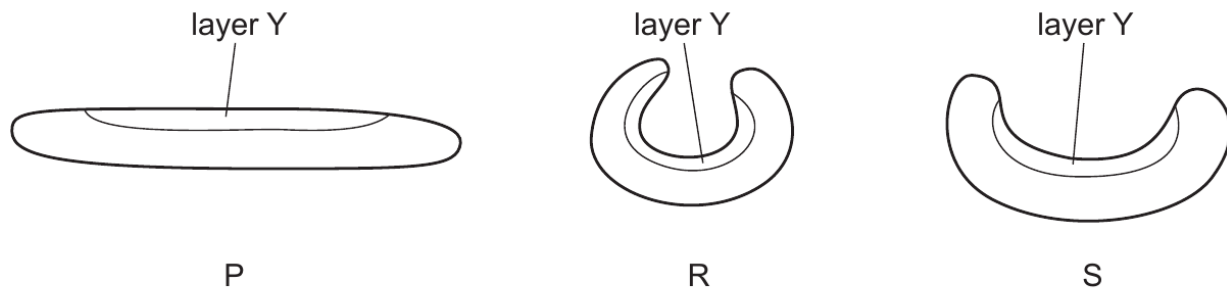
Question No 48 - (9700_s23_12_28)

Where does water evaporate from during transpiration?

- A** intercellular spaces
- B** leaf surface
- C** mesophyll cell walls
- D** stomatal pores

Question No 49 - (9700_s23_12_29)

The diagram shows the outline of three xerophytic leaves of the same type in three different conditions, P, R and S.

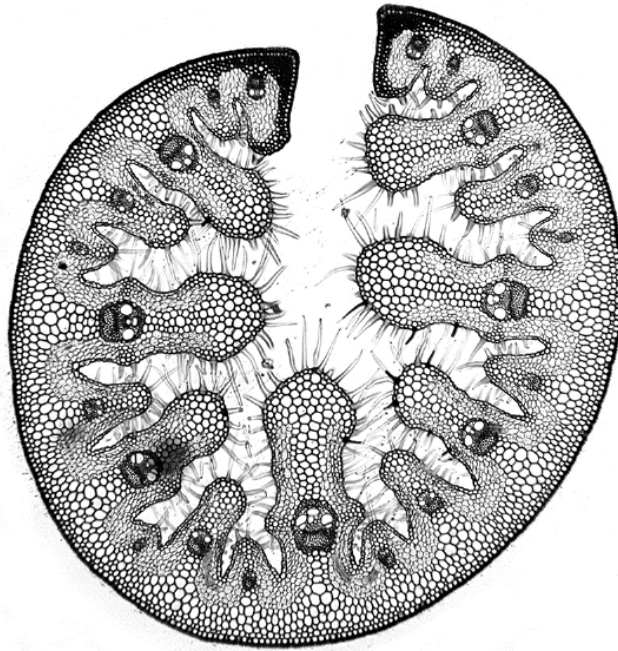


Which description of the water potential of the cells in layer Y is correct?

	water potential of cells in layer Y		
	P	R	S
A	higher than R and S	lower than P and S	lower than P
B	higher than S	lower than P	higher than P
C	lower than R	higher than S	higher than R
D	lower than R and S	higher than P	lower than P

Question No 50 - (9700_s23_12_30)

The photomicrograph shows a transverse section of the leaf of a species of grass.



The grass is specially adapted to grow in a dry habitat.

Which row correctly explains how the features help the grass to grow in this habitat?

	hair-like structures	leaf shape
A	increase internal humidity	decrease external humidity
B	decrease external humidity	increase internal humidity
C	increase internal humidity	increase internal humidity
D	decrease external humidity	decrease external humidity

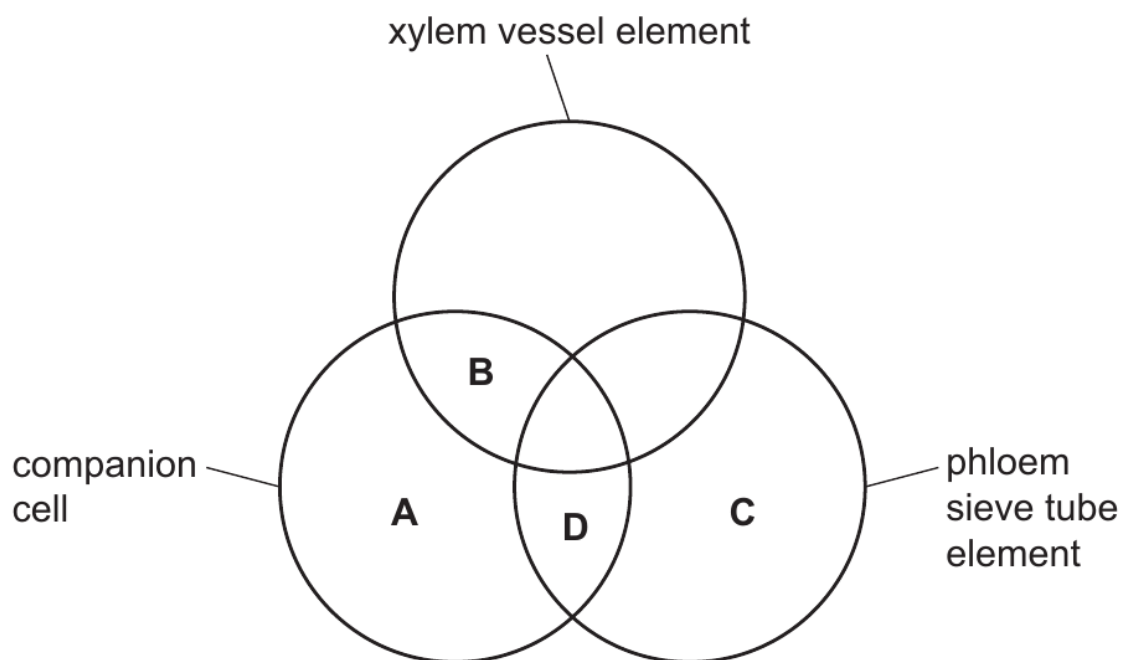
Question No 51 - (9700_s23_12_31)

Which statement supports the theory of active loading of sucrose into companion cells?

- A** The pH decreases in the cell wall of the companion cells compared with the cytoplasm.
- B** The pH decreases in the cytoplasm of the companion cells compared with the cell wall.
- C** The pH decreases in the companion cells and sieve tube elements.
- D** The pH decreases in the sieve tube elements compared with the companion cells.

Question No 52 - (9700_s23_11_23)

Which structures contain cytoplasm with mitochondria and a nucleus?

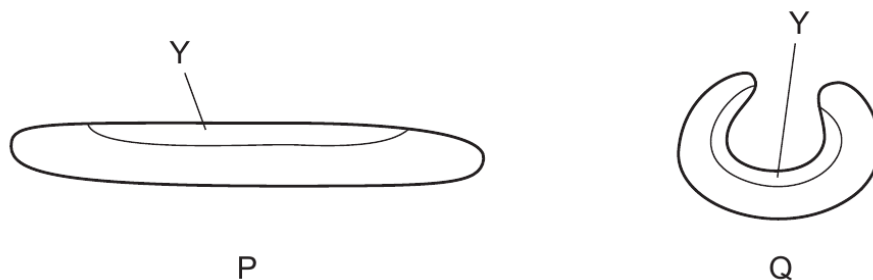
**Question No 53 - (9700_s23_11_24)**

What is the correct term to describe intermolecular hydrogen bonding between water molecules?

- A** adhesion
- B** cohesion
- C** osmosis
- D** diffusion

Question No 54 - (9700_s23_11_25)

The diagram shows the outline of a xerophytic leaf that had been left for 45 minutes in different conditions, P and Q.



Which statements about the cells in layer Y of the leaf in each of the conditions P and Q **after** 45 minutes are correct?

- 1 There is a less negative water potential in P than in Q.
- 2 The cells may be turgid in P and plasmolysed in Q.
- 3 The cells are less turgid in P than in Q.
- 4 There is no net diffusion of water into Y in either P or Q.

A 1, 2 and 4 **B** 1, 3 and 4 **C** 1 and 3 only **D** 2 and 4 only

Question No 55 - (9700_s23_11_26)

How does sucrose move from chloroplasts to the phloem?

- 1 diffusion
- 2 apoplast pathway
- 3 symplast pathway

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

Question No 56 - (9700_s23_11_27)

How are companion cells involved in loading sucrose into phloem sieve tube elements?

- A** actively through cotransporter proteins and passively through plasmodesmata
- B** actively through cotransporter proteins and plasmodesmata
- C** passively through cotransporter proteins only
- D** actively through plasmodesmata only

Question No 57 - (9700_m23_12_25)

Which row correctly matches the structure and function of phloem sieve tube elements?

	structure	function
A	peripheral cytoplasm with no nucleus	to provide as little resistance to flow as possible
B	end walls modified to form sieve plates	to slow down the rate of transport of solutes
C	elongated cells joined end to end	to form a tube to transport dissolved mineral ions and water
D	cellulose cell wall with no lignin	to prevent loss of water

Question No 58 - (9700_m23_12_26)

Which feature of xylem vessel elements helps adhesion during transpiration?

- A** Lignin forms a complete secondary wall.
- B** New vessels carry extra water as the plants grow.
- C** There are no cross walls between vessel elements.
- D** The vessel elements form a narrow tube.

Question No 59 - (9700_m23_12_27)

Mass flow is the bulk movement of materials from one place to another.

How many of the vessels listed carry fluids by mass flow?

- artery
- phloem sieve tube
- vein
- xylem vessel

A 1

B 2

C 3

D 4

Question No 60 - (9700_m23_12_28)

Cellulose, lignin and suberin are components of various plant cell walls.

Descriptions of these cell wall components are listed.

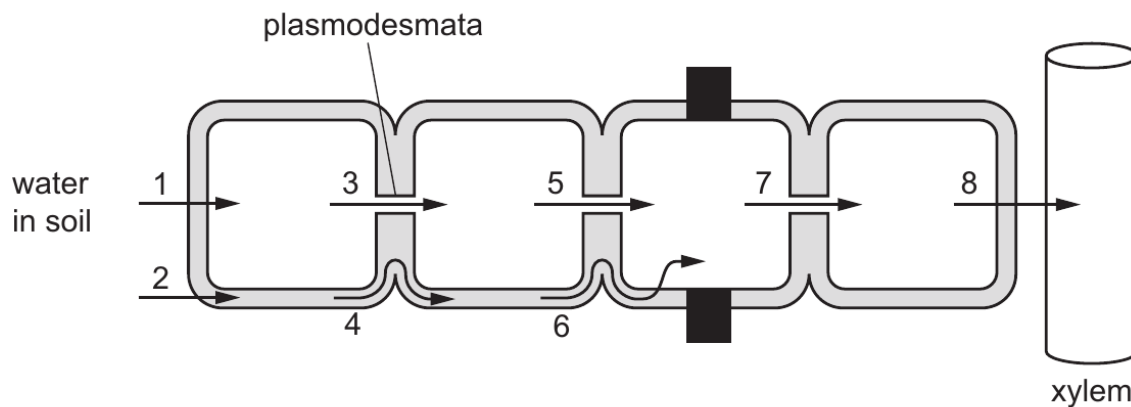
- 1 a component of the Casparian strip
- 2 redirects water into the symplast pathway
- 3 a hydrophobic component of cell walls
- 4 water interacts with this molecule in the apoplast pathway

Which row correctly matches three of the descriptions with cell wall components?

	cellulose	lignin	suberin
A	2	4	1
B	3	4	2
C	4	1	2
D	4	3	1

Question No 61 - (9700_m23_12_29)

The arrows show the direction of water movement across a plant root, from water in the soil to the xylem.



Which arrows show water movement **only** in the apoplast pathway?

- A** 1, 3, 5, 7 and 8
- B** 2, 4 and 6
- C** 2 and 4 only
- D** 3, 5 and 7 only

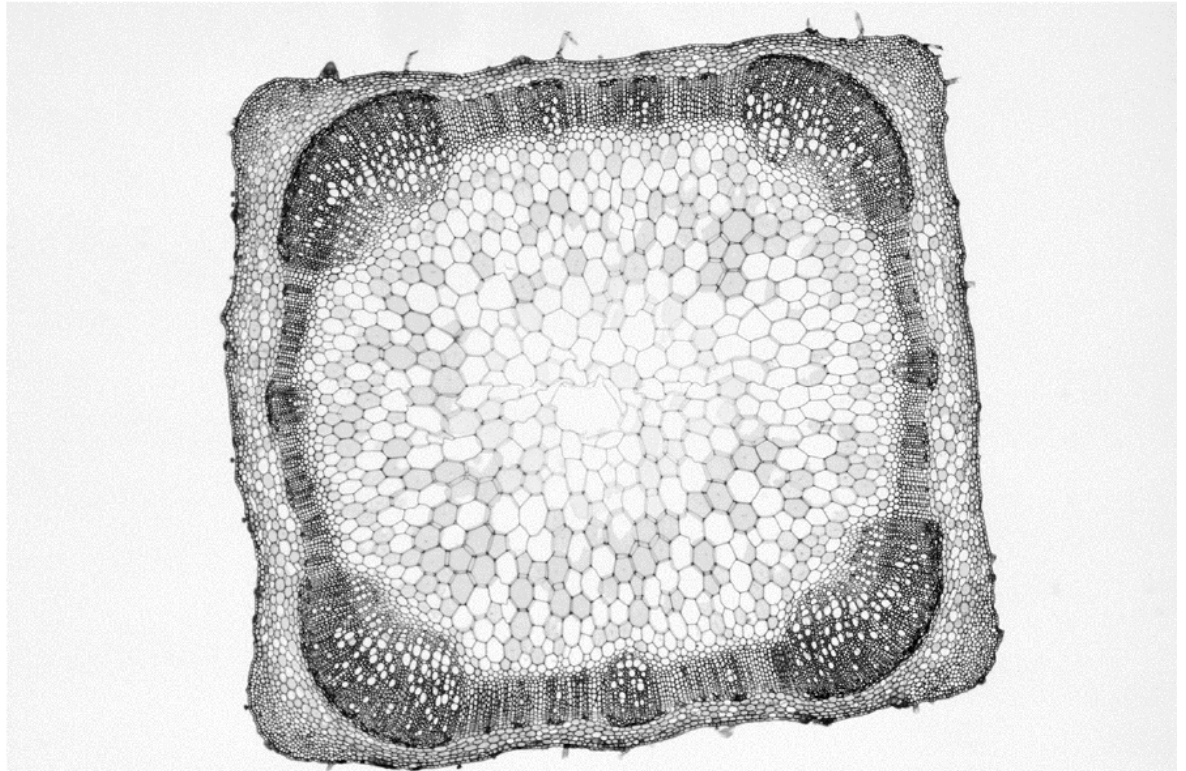
Question No 62 - (9700_m23_12_30)

Which row correctly identifies sources and sinks of sugars?

	root cells absorbing mineral ions	storage cells of seed that is starting to grow
A	sink	source
B	sink	sink
C	source	source
D	source	sink

Question No 63 - (9700_w22_13_26)

The photomicrograph shows a section through a plant organ.



Which statement could be used to describe this organ?

- A** The central region of this organ has supporting tissue.
- B** The endodermis tissue is a thick layer around the edge of the organ.
- C** The epidermis tissue in this organ has extensions (trichomes).
- D** The xylem tissue is found in greatest density in the centre of the organ.

Question No 64 - (9700_w22_13_27)

The statements describe some of the properties of water.

- 1 requires a lot of heat energy to evaporate
- 2 retains a lot of heat energy
- 3 is able to form hydrogen bonds with other water molecules
- 4 is able to form hydrogen bonds with other polar and non-polar molecules

Which properties are **also** important for transport in xylem?

- A** 1, 2 and 3 **B** 1, 2 and 4 **C** 1 and 3 only **D** 3 and 4

Question No 65 - (9700_w22_13_28)

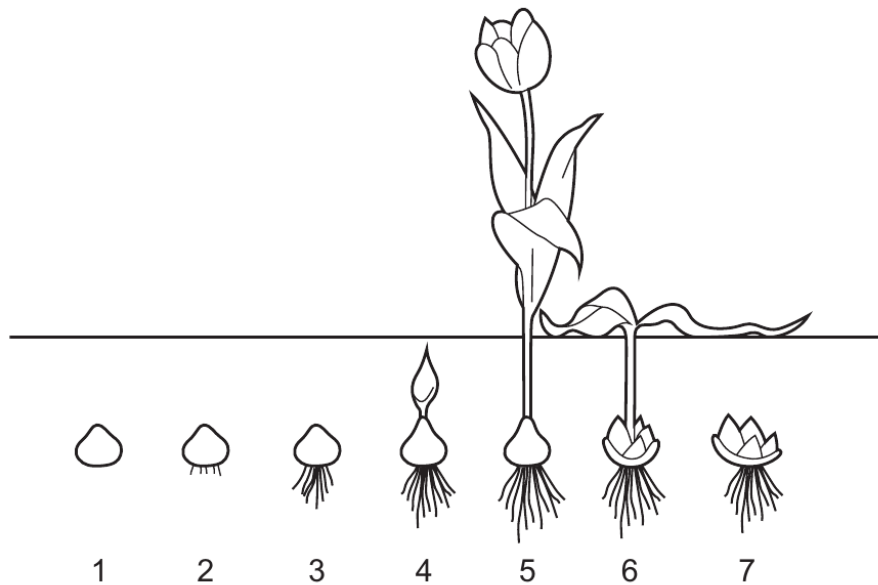
Which xerophytic adaptations reduce the water potential gradient between leaf surface and atmosphere?

- 1 rolled leaves
- 2 hairy leaves
- 3 sunken stomata
- 4 fewer stomata
- 5 fleshy leaves

- A** 1, 2, 3, 4 and 5
B 1, 2 and 3 only
C 1, 3 and 4 only
D 2 and 5 only

Question No 66 - (9700_w22_13_29)

The diagram shows seven stages of a tulip bulb's growth.



Which row identifies the correct stages in which the tulip bulb is acting as a source only or as a sink only?

	source only	sink only
A	1	5
B	3	4
C	4	6
D	5	7

Question No 67 - (9700_w22_13_30)

What would be changed if mitochondrial activity was inhibited by a metabolic poison acting on cells in the phloem tissue?

- 1 concentration of hydrogen ions in the cell wall of companion cells
- 2 concentration of sucrose in the cytoplasm of cells in a leaf
- 3 hydrostatic pressure gradient in the phloem sieve tube

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

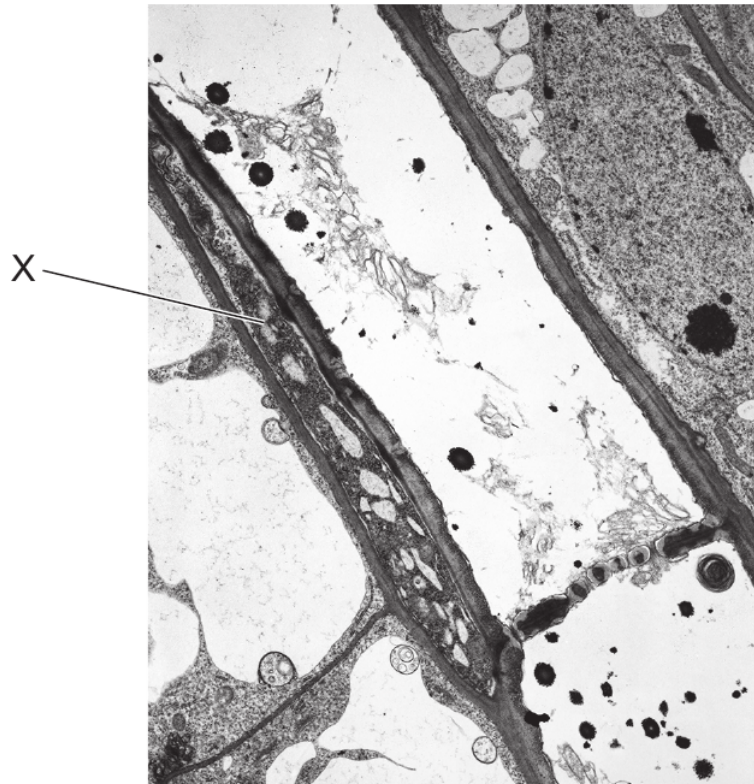
Question No 68 - (9700_w22_13_31)

By which process does sucrose move through phloem sieve tube elements?

- A** active transport
- B** diffusion
- C** facilitated diffusion
- D** mass flow

Question No 69 - (9700_w22_12_26)

The electron micrograph shows a longitudinal section through part of a plant stem.



What is X?

- A** xylem vessel element
- B** stem cell
- C** phloem sieve tube element
- D** companion cell

Question No 70 - (9700_w22_12_27)

Sodium chloride is added to a culture solution containing freshwater single-celled plant cells.

What happens to the water potential of the culture solution when the sodium chloride is added and what may happen to the plant cells after 5 minutes?

	water potential of the culture solution when sodium chloride added	single-celled plant cells after 5 minutes
A	becomes less negative	become plasmolysed
B	becomes less negative	become turgid
C	becomes more negative	become plasmolysed
D	becomes more negative	become turgid

Question No 71 - (9700_w22_12_28)

Which statements correctly describe transport pathways in dicotyledonous plants?

- 1 In the apoplast pathway, water may move through plasmodesmata.
- 2 In the symplast pathway, water may move through intercellular spaces.
- 3 The apoplast pathway may be blocked by the Casparian strip.

A 1 and 2 **B** 1 and 3 **C** 2 and 3 **D** 3 only

Question No 72 - (9700_w22_12_29)

Which statement about the movement of water from roots to leaves is **not** correct?

- A** A continuous column of water is partly maintained by the attraction of water molecules to cellulose.
- B** Hydrogen bonding between water molecules enables mass flow of water.
- C** Hydrostatic pressure in xylem vessel elements is higher in roots than in leaves.
- D** Water potential changes throughout the length of the xylem vessel elements.

Question No 73 - (9700_w22_12_30)

Which terms describe the method by which water is transported within xylem vessel elements?

- 1 cotransport
- 2 cohesion-tension
- 3 osmosis

A 1 and 2 **B** 1 and 3 **C** 2 only **D** 3 only

Question No 74 - (9700_w22_12_31)

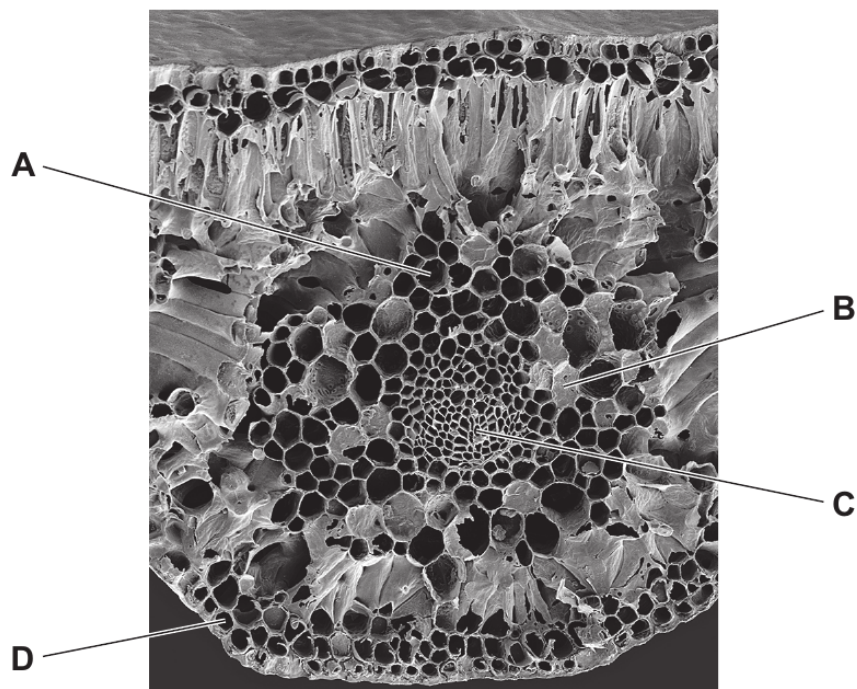
What is the main function of a companion cell in phloem tissue?

- A** providing cytoplasmic contact with the sieve tube element for loading
- B** providing structural support for the sieve tube element
- C** providing the nucleus for cell division in the phloem
- D** providing the source of assimilates for storage

Question No 75 - (9700_w22_11_26)

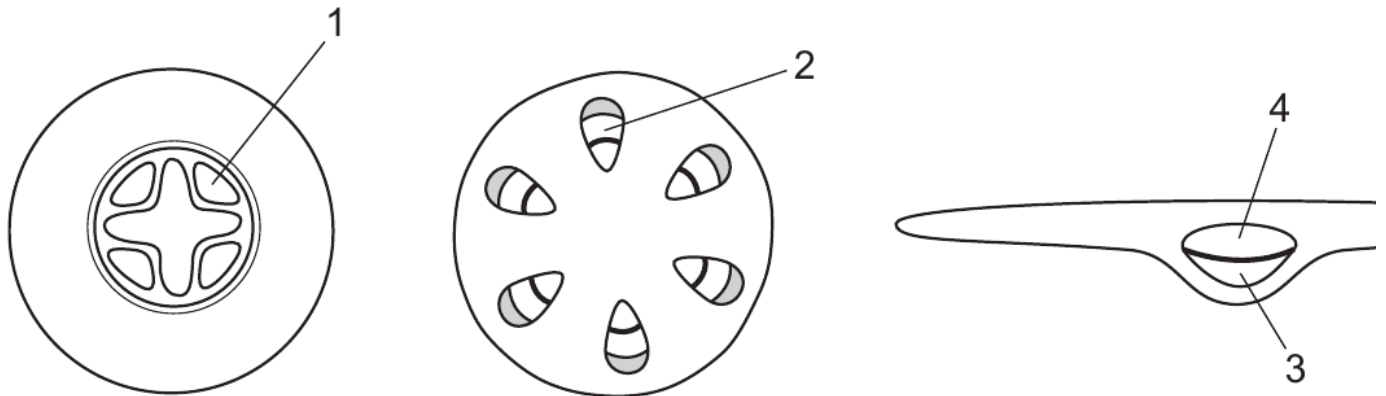
The electron micrograph shows a cross-section of a leaf vein and some neighbouring cells.

Which structure contributes to mass flow by the use of proton pumps?



Question No 76 - (9700_w22_11_27)

The diagrams show some tissue types in plant organs.



Which row identifies the tissue types?

	1	2	3	4
A	phloem	phloem	phloem	xylem
B	phloem	xylem	phloem	xylem
C	xylem	phloem	xylem	phloem
D	xylem	xylem	phloem	xylem

Question No 77 - (9700_w22_11_28)

Which description of xylem vessel elements is correct?

- A** cells joined to form a tube, pits at intervals, sieve plates between cells, surrounded by the endodermis in roots
- B** contains cells joined end to end, containing cytoplasm, cell walls with lignin, located to the outside of phloem in vascular bundles
- C** contains elongated cells with end walls broken down, located in vascular bundles in the stem and leaves
- D** dead elongated cells, lignified cell walls with pits at intervals, associated with companion cells in the roots only

Question No 78 - (9700_w22_11_29)

Which properties of lignin are important for the function of xylem vessels in the stem of a tall plant, such as a tree?

- 1 It is inflexible so does not bend easily.
- 2 It is not permeable to water.
- 3 It is strong to resist collapse under pressure.
- 4 It has weaker adhesion to water molecules than cellulose.

- A** 1, 2 and 3 **B** 1, 2 and 4 **C** 1, 3 and 4 **D** 2, 3 and 4

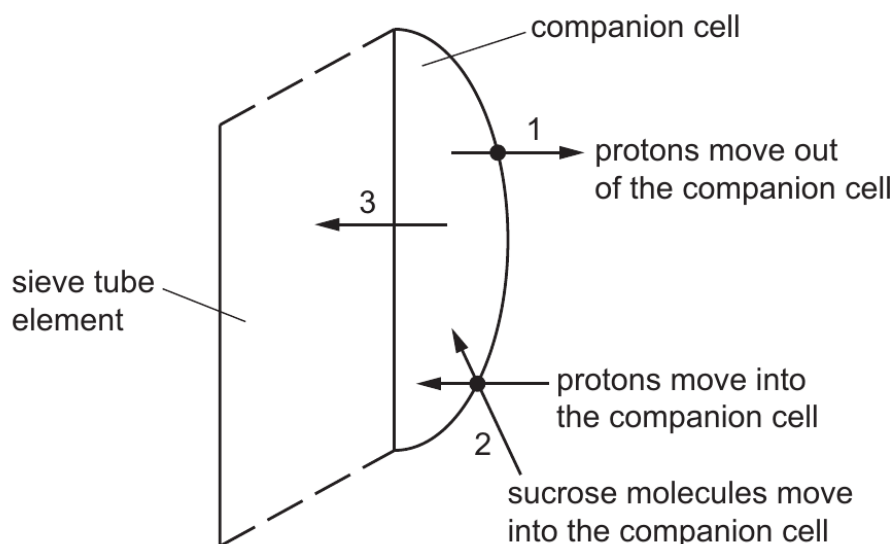
Question No 79 - (9700_w22_11_30)

Which row is correct for the sucrose concentrations and the water potentials in a source and a sink in a potato plant, at 12:00 p.m.?

	sucrose concentration		water potential	
	source	sink	source	sink
A	higher	lower	higher	lower
B	higher	lower	lower	higher
C	lower	higher	higher	lower
D	lower	higher	lower	higher

Question No 80 - (9700_w22_11_31)

The diagram shows one possible way in which sucrose may be loaded into a sieve tube element.



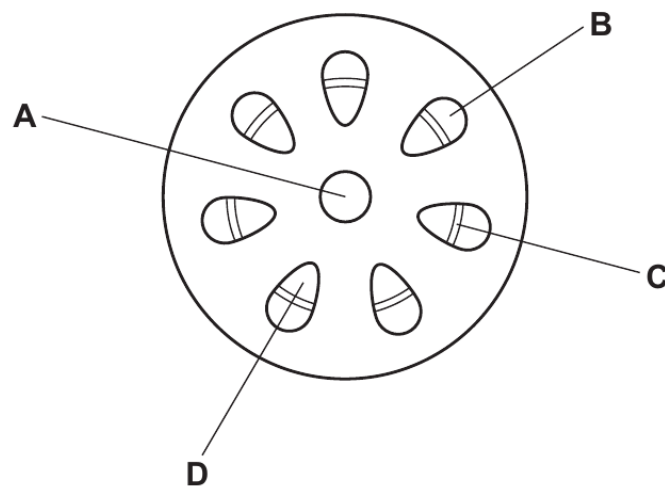
Which steps require ATP?

- A** 1 and 2 **B** 1 and 3 **C** 1 only **D** 3 only

Question No 81 - (9700_s22_13_26)

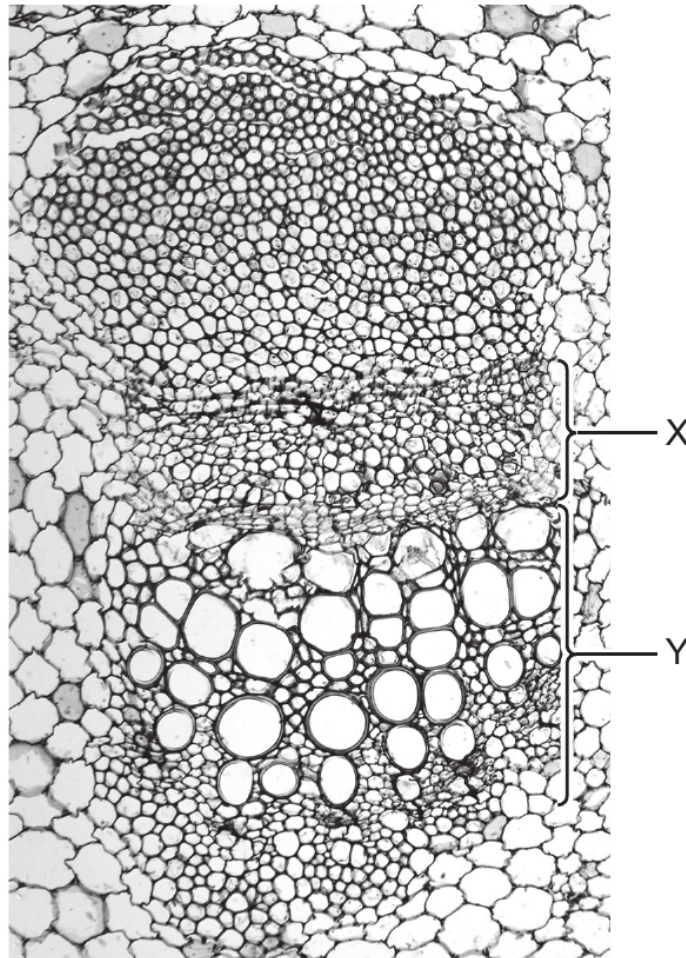
The diagram shows a plant organ.

Which letter correctly labels the xylem?



Question No 82 - (9700_s22_13_27)

The photomicrograph shows a vascular bundle found in a plant organ.



Which statements about this vascular bundle are correct?

- 1 The vascular bundle is part of the structure of a root.
- 2 Some of the cells in region X have very large numbers of mitochondria.
- 3 Region Y is made up of a number of different cell types.

A 1 and 2 **B** 1 only **C** 2 and 3 **D** 3 only

Question No 83 - (9700_s22_13_28)

Which changes to the water potential and the volume of solution in the phloem sieve tube element occur when sucrose is moved from the phloem sieve tube element to an actively dividing shoot tip?

	water potential in phloem sieve tube element becomes	volume of solution in phloem sieve tube element
A	higher	decreases
B	higher	increases
C	lower	decreases
D	lower	increases

Question No 84 - (9700_s22_13_29)

Which processes occur during the loading of sucrose into phloem sieve tubes?

- 1 Protons are pumped out of the cytoplasm of the companion cell into its cell wall.
- 2 There is a higher concentration of protons in the symplastic pathway outside the companion cell.
- 3 Protons are unable to move back into the companion cell.
- 4 A co-transporter molecule acts as a carrier for protons and sucrose.

A 1 and 2 **B** 1 and 4 **C** 2 and 3 **D** 3 and 4

Question No 85 - (9700_s22_12_24)

Some of the features present in transport tissues are listed.

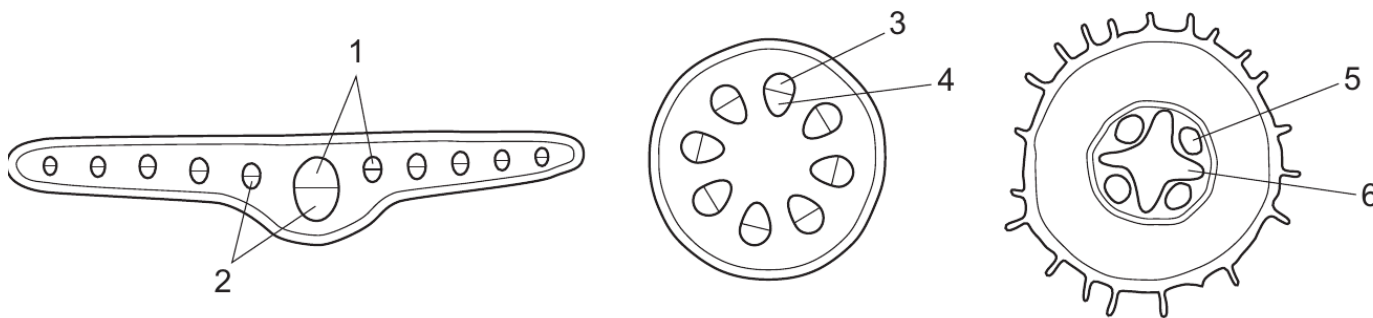
- 1 lignified walls
- 2 cytoplasm
- 3 mitochondria
- 4 pits
- 5 plasmodesmata

Which features are present in xylem vessel elements?

- A** 1, 2, 3 and 4
- B** 1, 4 and 5
- C** 1 and 4 only
- D** 2, 3 and 5

Question No 86 - (9700_s22_12_25)

The diagrams show transverse sections through parts of plants.



Which row is correct?

	contains lignin	transports organic solutes
A	1, 4, 5	2, 3, 6
B	1, 4, 6	2, 3, 5
C	2, 3, 5	1, 4, 6
D	2, 4, 6	1, 3, 5

Question No 87 - (9700_s22_12_26)

Which molecules form hydrogen bonds with water during transpiration?

- 1 cellulose in the xylem wall
- 2 suberin in the xylem wall
- 3 other water molecules in the xylem

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

Question No 88 - (9700_s22_12_27)

Some plant species can take up heavy metal contaminants that are dissolved in soil water and then transport them within the plant. Within plant cells, the heavy metals accumulate mainly in the vacuole.

Which suggestions about the transport and accumulation of heavy metals are valid?

- 1 After initial entry into the root, some of the heavy metals can pass through the tonoplast to be stored in the vacuole of cells in the cortex.
- 2 The heavy metals take an apoplastic pathway in the xylem but at the endodermis must take a symplastic pathway.
- 3 The rate of accumulation of the heavy metals in leaf cells will be faster at night, when photosynthesis is not occurring, than during the day.
- 4 The presence of heavy metals causes the transpiration stream to slow down and reduce the rate of transpiration.

A 1 and 2 **B** 1 and 4 **C** 2 and 3 **D** 3 and 4

Question No 89 - (9700_s22_12_28)

What is the correct route for the movement of water from cell to cell in the apoplast pathway?

- A** through adjacent cell surface membranes
- B** through intercellular spaces
- C** through plasmodesmata
- D** through the Casparian strip

Question No 90 - (9700_s22_12_29)

Which row shows the correct sequence for the movement of sucrose into phloem sieve tubes?

	first	second	third
A	diffusion of sucrose into the companion cell cytoplasm	active transport of protons into the companion cell cytoplasm	cotransport of protons and sucrose into the sieve tubes
B	cotransport of protons and sucrose into the companion cell cytoplasm	active transport of protons out of the companion cell cytoplasm	diffusion of sucrose into the sieve tubes
C	active transport of protons into the companion cell cytoplasm	diffusion of sucrose into the companion cell cytoplasm	cotransport of protons and sucrose into the sieve tubes
D	active transport of protons out of the companion cell cytoplasm	cotransport of protons and sucrose into the companion cell cytoplasm	diffusion of sucrose into the sieve tubes

Question No 91 - (9700_s22_11_26)

Which row is correct for the movement of water in a root?

	pathway	molecule present in Casparian strip
A	apoplast pathway through intercellular spaces	suberin
B	apoplast pathway through plasmodesmata	lignin
C	symplast pathway through plasmodesmata	lignin
D	symplast pathway through intercellular spaces	suberin

Question No 92 - (9700_s22_11_27)

The table contains some information about uptake and movement of water and of mineral ions in plants.

	water	mineral ions
mechanism for uptake	osmosis	diffusion, active transport
site of uptake	root hair cells	root hair cells
mechanism of release	evaporation, diffusion	diffusion, active transport
site of release	stomata	plant cells

Using the information provided, which factors will affect the uptake and movement of water or of mineral ions in plants?

- 1 humidity
- 2 surface area of root hair cell
- 3 oxygen concentration
- 4 temperature

- A** 1, 2, 3 and 4
- B** 1, 3 and 4 only
- C** 1 and 3 only
- D** 4 only

Question No 93 - (9700_s22_11_29)

A student wrote the following statements about a possible mechanism for loading sucrose from a source.

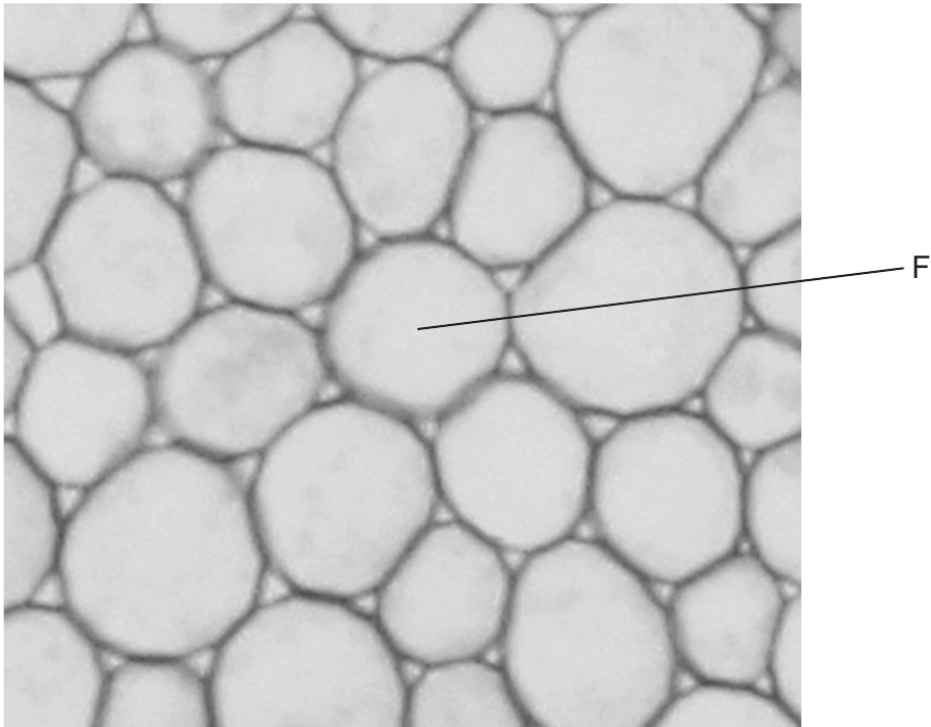
- 1 When energy is released from ATP, the released energy is used to move sucrose through a co-transporter protein in the companion cell membrane.
- 2 As sucrose is moved into a companion cell the pH in the cell wall of the companion cell decreases.
- 3 Proton pumps in the cell membrane of a companion cell move sucrose into the phloem sieve tube element.

Which statements are correct?

- A** 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 only

Question No 94 - (9700_m22_12_25)

Some students were asked to look at the photomicrograph of a cross-section of unfamiliar material and describe what they could see.



The students described the cross-section of F as:

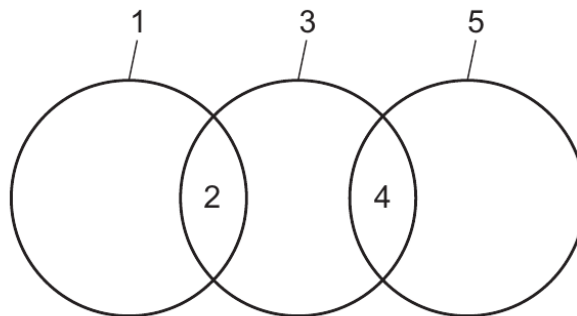
- 1 circular
- 2 a hollow tube
- 3 spherical.

Which descriptions of the cross-section of F correctly state what the students could actually see?

- A** 1, 2 and 3 **B** 1 and 2 only **C** 1 only **D** 3 only

Question No 95 - (9700_m22_12_26)

The diagram shows the relationship between phloem sieve tube elements, xylem vessel elements and companion cells.



Which row correctly identifies what could be represented by the numbers 1, 2, 3, 4 and 5?

	1	2	3	4	5
A	companion cells	endoplasmic reticulum	phloem sieve tube elements	no nucleus	xylem vessel elements
B	companion cells	nucleus	phloem sieve tube elements	cytoplasm	xylem vessel elements
C	phloem sieve tube elements	mitochondria	companion cells	nucleus	xylem vessel elements
D	xylem vessel elements	no cytoplasm	phloem sieve tube elements	vacuole	companion cells

Question No 96 - (9700_m22_12_27)

Why does an air bubble in a xylem vessel element stop the flow of water?

- 1 loss of adhesion
- 2 loss of cohesion
- 3 collapse of xylem vessel element

A 1, 2 and 3 **B** 1 and 3 only **C** 1 only **D** 2 only

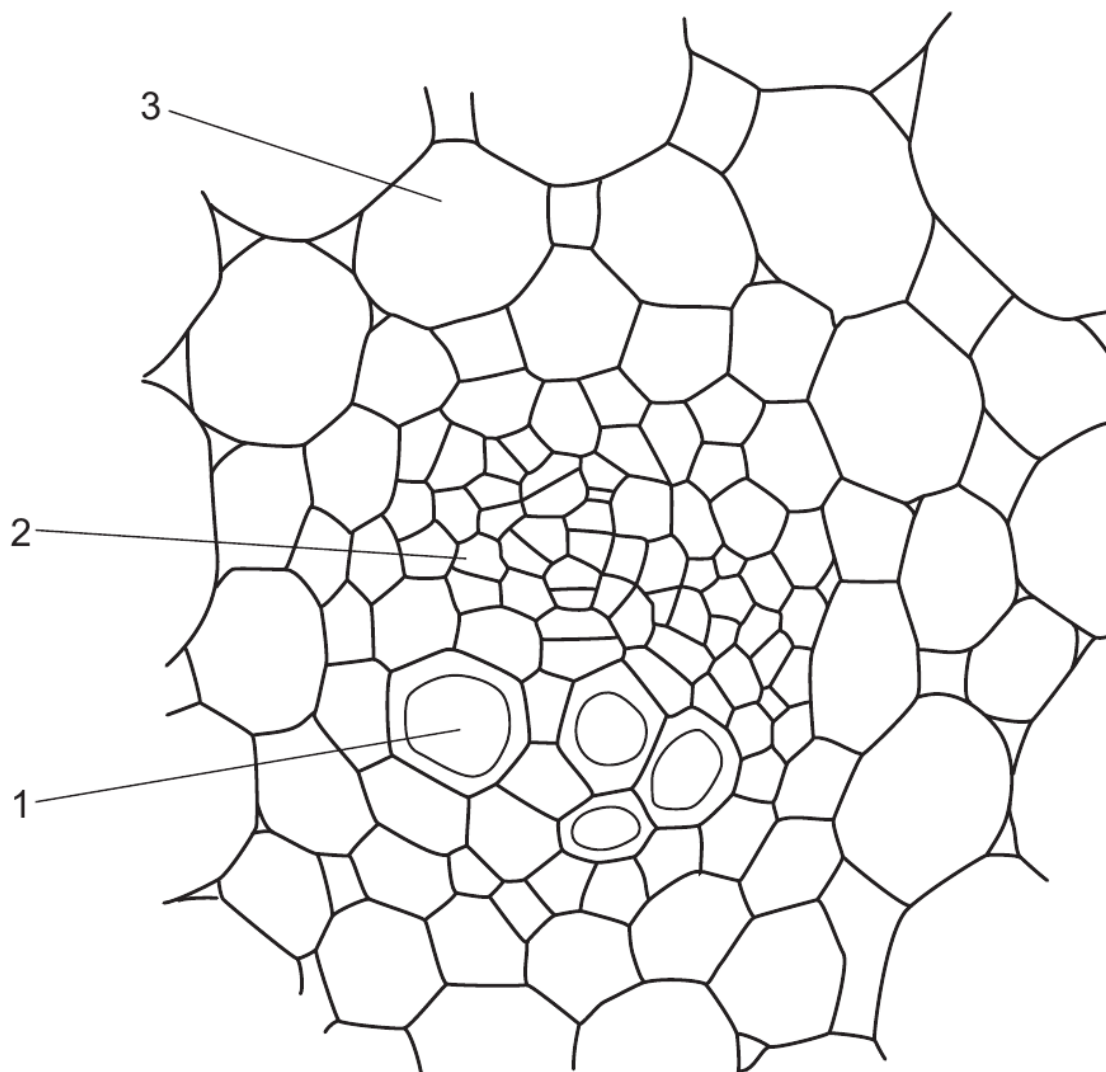
Question No 97 - (9700_m22_12_28)

Which changes to the water potential and the volume of solution in a phloem sieve tube occur when amino acids are moved into a sink from the phloem sieve tube?

	water potential in the phloem sieve tube becomes	volume of solution in the phloem sieve tube
A	higher	decreases
B	higher	increases
C	lower	decreases
D	lower	increases

Question No 98 - (9700_w21_13_23)

The diagram shows a vascular bundle from the stem of a plant.



Which row describes the functions of the labelled cells?

	transports sucrose	transports mineral ions	stores starch
A	1	2	3
B	2	1	3
C	2	3	1
D	3	1	2

Question No 99 - (9700_w21_13_24)

Some of the features present in the transport tissues of plants are listed.

- 1 lignified walls
- 2 cytoplasm
- 3 mitochondria
- 4 chloroplasts
- 5 plasmodesmata

Which features are present in sieve tube elements?

- A** 1, 2 and 5 **B** 1, 3 and 4 **C** 2, 3 and 5 **D** 2, 4 and 5

Question No 100 - (9700_w21_13_25)

Which statements explain why transpiration is an inevitable consequence of gas exchange in plants?

- 1 Hydrolysis reactions are taking place in cells.
- 2 ATP production is occurring.
- 3 Stomata must be open.

- A** 1, 2 and 3 **B** 1 and 2 only **C** 2 and 3 only **D** 3 only

Correct Answers for MCQs

Question 1 (9700_w24_13_28) : B
Question 2 (9700_w24_13_29) : A
Question 3 (9700_w24_12_26) : B
Question 4 (9700_w24_12_27) : B
Question 5 (9700_w24_12_28) : A
Question 6 (9700_w24_11_27) : A
Question 7 (9700_w24_11_28) : C
Question 8 (9700_w24_11_29) : B
Question 9 (9700_w24_11_33) : D
Question 10 (9700_m16_12_23) : C
Question 11 (9700_m16_12_24) : A
Question 12 (9700_m16_12_25) : A
Question 13 (9700_m16_12_26) : B
Question 14 (9700_m16_12_27) : B
Question 15 (9700_s24_13_25) : B
Question 16 (9700_s24_13_26) : D
Question 17 (9700_s24_13_27) : C
Question 18 (9700_s24_13_28) : A
Question 19 (9700_s24_12_24) : A
Question 20 (9700_s24_12_25) : A
Question 21 (9700_s24_12_26) : A
Question 22 (9700_s24_12_27) : B
Question 23 (9700_s24_11_24) : C
Question 24 (9700_s24_11_25) : B
Question 25 (9700_m24_12_28) : D
Question 26 (9700_m24_12_29) : B
Question 27 (9700_m24_12_30) : D
Question 28 (9700_m24_12_31) : B
Question 29 (9700_w23_13_25) : B
Question 30 (9700_w23_13_26) : D
Question 31 (9700_w23_13_27) : A
Question 32 (9700_w23_12_24) : D
Question 33 (9700_w23_12_25) : B
Question 34 (9700_w23_12_26) : A
Question 35 (9700_w23_12_27) : B
Question 36 (9700_w23_12_28) : B

Question 37 (9700_w23_11_26) : B
Question 38 (9700_w23_11_28) : C
Question 39 (9700_w23_11_29) : D
Question 40 (9700_s23_13_27) : C
Question 41 (9700_s23_13_28) : B
Question 42 (9700_s23_13_29) : D
Question 43 (9700_s23_13_30) : D
Question 44 (9700_s23_13_31) : D
Question 45 (9700_s23_13_32) : C
Question 46 (9700_s23_12_26) : B
Question 47 (9700_s23_12_27) : B
Question 48 (9700_s23_12_28) : C
Question 49 (9700_s23_12_29) : A
Question 50 (9700_s23_12_30) : C
Question 51 (9700_s23_12_31) : A
Question 52 (9700_s23_11_23) : A
Question 53 (9700_s23_11_24) : B
Question 54 (9700_s23_11_25) : A
Question 55 (9700_s23_11_26) : A
Question 56 (9700_s23_11_27) : A
Question 57 (9700_m23_12_25) : A
Question 58 (9700_m23_12_26) : D
Question 59 (9700_m23_12_27) : D
Question 60 (9700_m23_12_28) : D
Question 61 (9700_m23_12_29) : C
Question 62 (9700_m23_12_30) : A
Question 63 (9700_w22_13_26) : C
Question 64 (9700_w22_13_27) : D
Question 65 (9700_w22_13_28) : B
Question 66 (9700_w22_13_29) : C
Question 67 (9700_w22_13_30) : A
Question 68 (9700_w22_13_31) : D
Question 69 (9700_w22_12_26) : D
Question 70 (9700_w22_12_27) : C
Question 71 (9700_w22_12_28) : D
Question 72 (9700_w22_12_29) : D
Question 73 (9700_w22_12_30) : C
Question 74 (9700_w22_12_31) : A

Question 75 (9700_w22_11_26) : C
Question 76 (9700_w22_11_27) : A
Question 77 (9700_w22_11_28) : C
Question 78 (9700_w22_11_29) : A
Question 79 (9700_w22_11_30) : B
Question 80 (9700_w22_11_31) : C
Question 81 (9700_s22_13_26) : D
Question 82 (9700_s22_13_27) : C
Question 83 (9700_s22_13_28) : A
Question 84 (9700_s22_13_29) : B
Question 85 (9700_s22_12_24) : C
Question 86 (9700_s22_12_25) : B
Question 87 (9700_s22_12_26) : C
Question 88 (9700_s22_12_27) : A
Question 89 (9700_s22_12_28) : B
Question 90 (9700_s22_12_29) : D
Question 91 (9700_s22_11_26) : A
Question 92 (9700_s22_11_27) : A
Question 93 (9700_s22_11_29) : D
Question 94 (9700_m22_12_25) : C
Question 95 (9700_m22_12_26) : A
Question 96 (9700_m22_12_27) : D
Question 97 (9700_m22_12_28) : A
Question 98 (9700_w21_13_23) : B
Question 99 (9700_w21_13_24) : C
Question 100 (9700_w21_13_25) : D